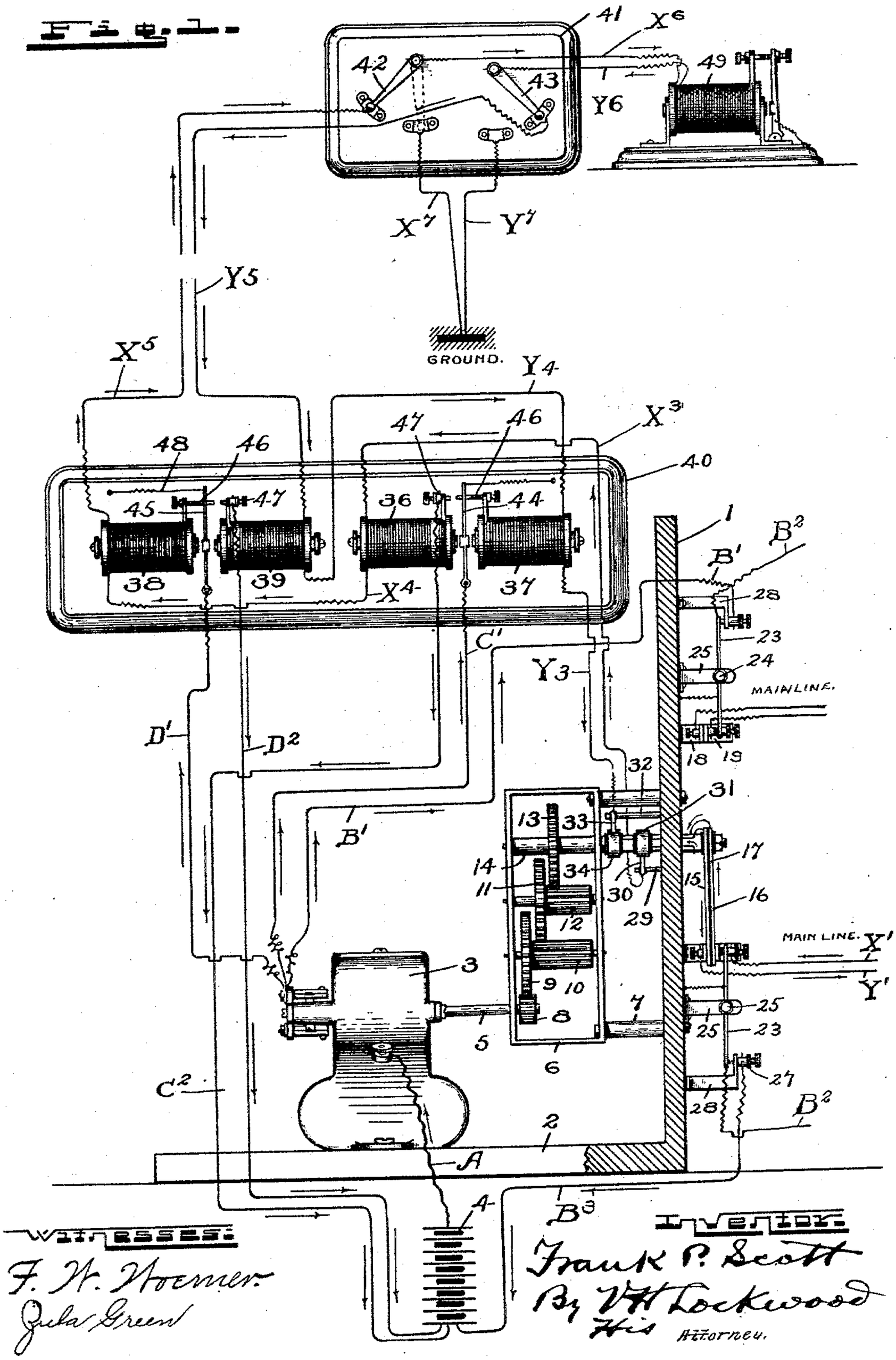
(No Model.) 2 Sheets—Sheet 1.

F. P. SCOTT.

TELEGRAPH SWITCH MECHANISM.

No. 571,695. Patented Nov. 17, 1896.

Fig. 1.



WITNESSES:

F. H. Hoerner.

Jula Green

INVENTOR.

Frank P. Scott

By W. H. Lockwood

His Attorney.

(No Model.) 2 Sheets—Sheet 2.

F. P. SCOTT.

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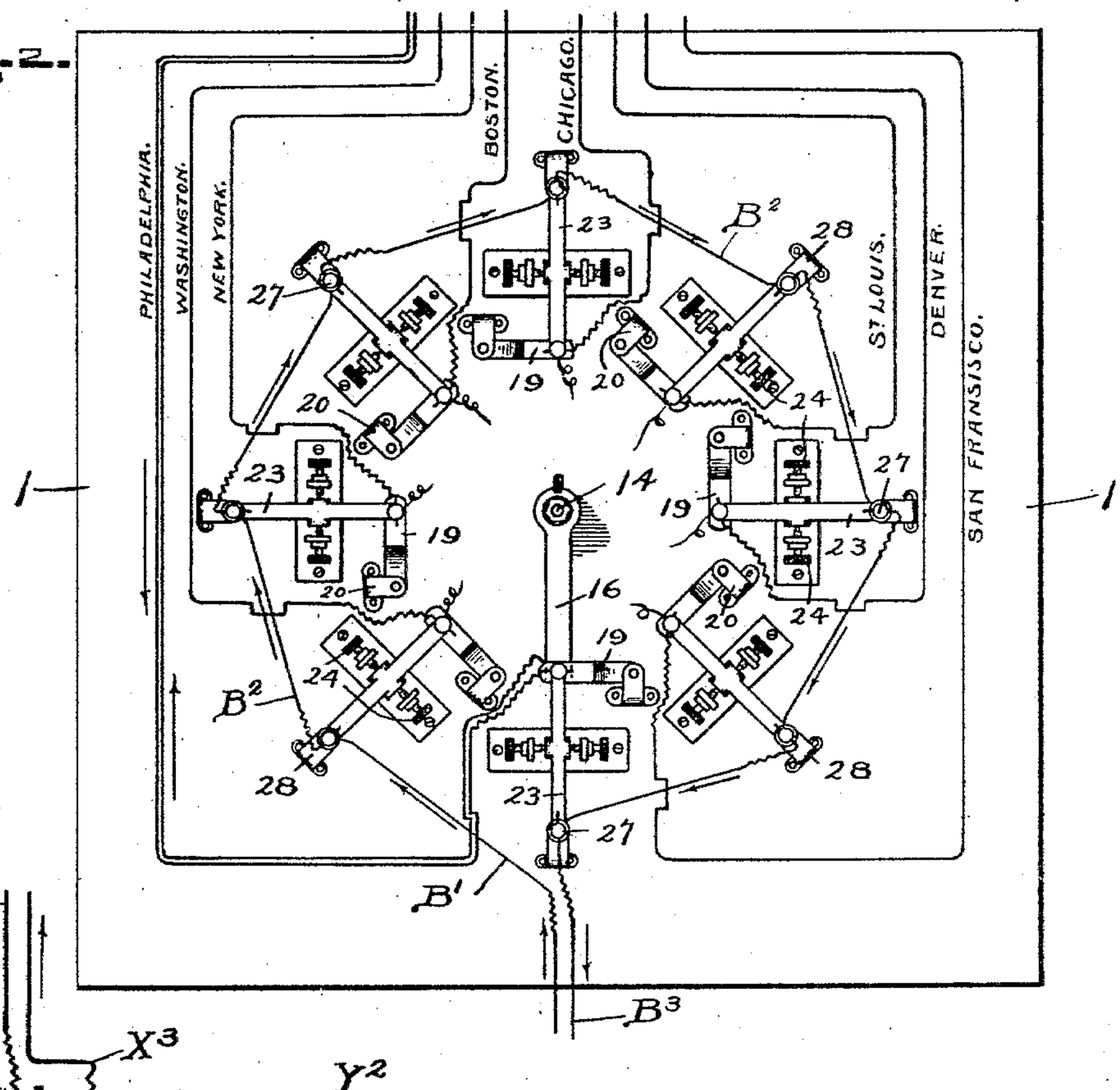
Fig. 2.



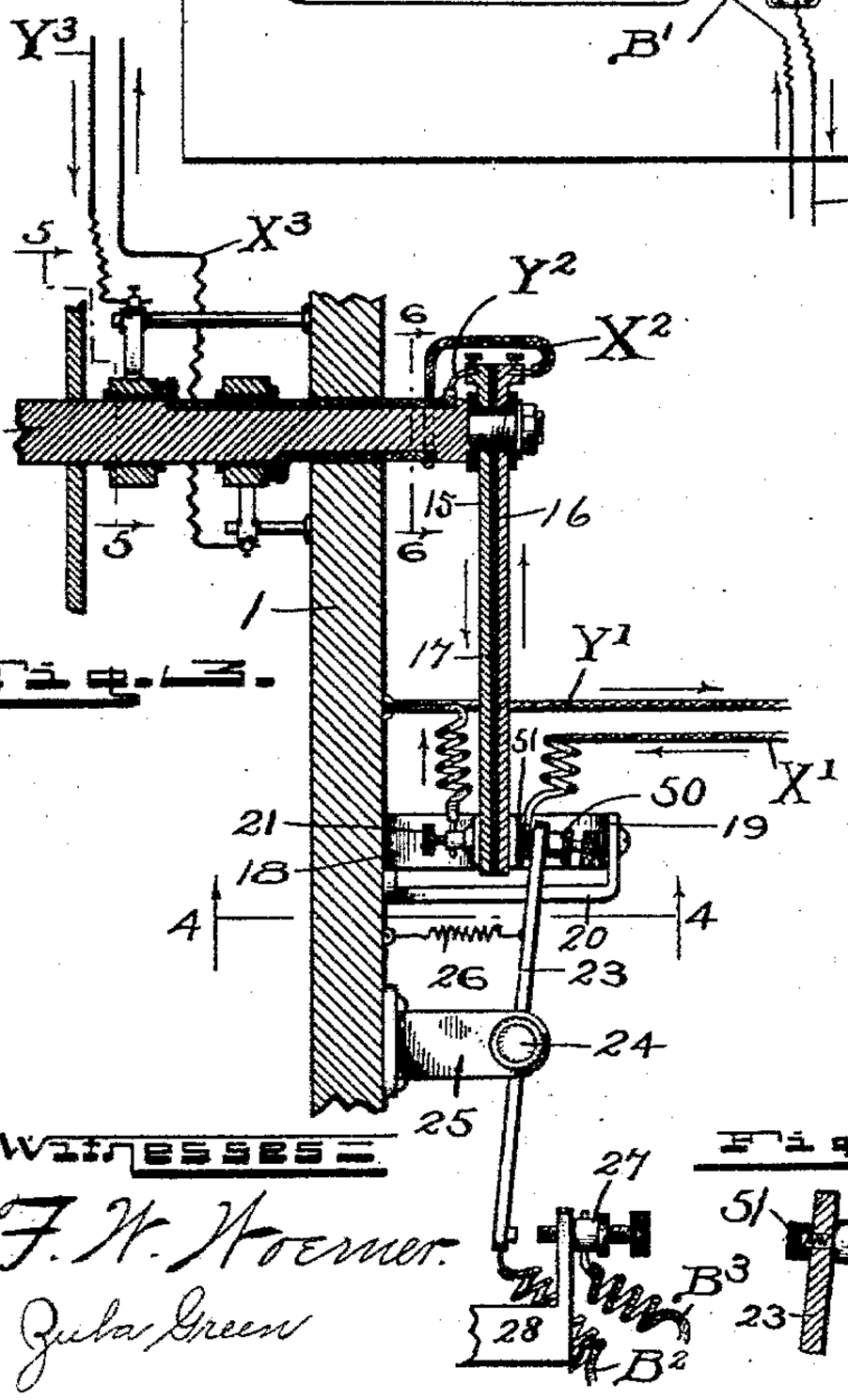


Fig. 3.

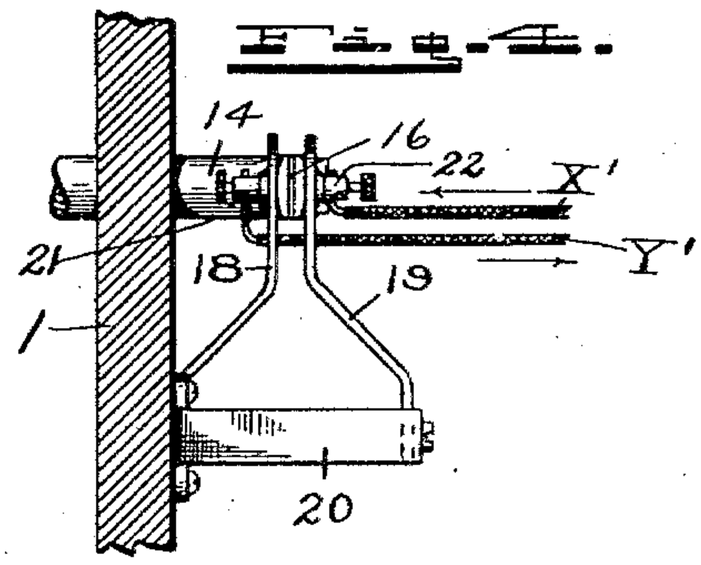


Fig. 4.

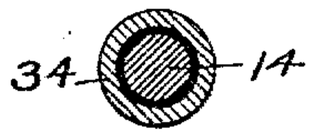


Fig. 5.

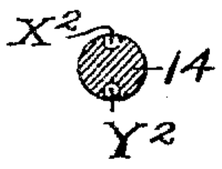


Fig. 6.

Fig. 7.

Witnesses—

F. H. Hoerner.

Zuba Green

Inventor—

Frank P. Scott

By V. H. Lockwood

His

Attorney

UNITED STATES PATENT OFFICE.

FRANK P. SCOTT, OF TERRE HAUTE, INDIANA.

TELEGRAPH SWITCH MECHANISM.

SPECIFICATION forming part of Letters Patent No. 571,695, dated November 17, 1896.

Application filed March 25, 1896. Serial No. 584,879. (No model.)

To all whom it may concern:

Be it known that I, FRANK P. SCOTT, of Terre Haute, county of Vigo, and State of Indiana, have invented a certain new and useful Telegraph Switch Mechanism; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, in which like letters and numerals refer to like parts.

My invention relates to switches for telegraph-circuits in which the switching mechanism is operated by an electric motor and the operation of said motor is controlled from a distant station.

The object of this invention is to provide a switch whereby a person at a branch station connected by a "loop" to the main station, the main station having a number of main lines running into it, may cut the loop running from the branch station to the main station into any of the main lines without the assistance of a person at the main station.

The switch is intended especially for the use of railway officials who have loops from the railway-offices to their residences.

This switch mechanism enables them to have the use of several wires from their residences without the necessity of calling the main office to have the operator there connect up the loop-wire with the main wire desired.

Frequently it happens that the operator at the main office is busy or for some reason causes a delay in making the connection. It furthermore frequently happens that the loop runs into a main office where there is no night operator, but the official at his residence may with my invention use his loop at night with any main wire running into the switch at the main office.

My invention is furthermore useful in branch telegraph-offices in cities which have a loop from the main office, as it enables the branch office to change from one main wire to another without the assistance of the operator at the main office.

The above object is attained by the mechanism and arrangement of wires illustrated in the accompanying drawings and described in the following specification.

In the drawings, Figure 1 is a side elevation of the mechanism which I use, the switchboard being partly broken away and the various circuits and connections shown in diagram. Fig. 2 is a front elevation of my switchboard, all but one of the return main wires being broken away. Fig. 3 is a central vertical section of a portion of the switchboard and the switch-arm shaft and connecting parts. Fig. 4 is a section of a portion of the switchboard on the line 4 4 of Fig. 3, showing a pair of the contact-pieces in side elevation. Fig. 5 is a cross-section of the switch-arm shaft at 5 5 of Fig. 3. Fig. 6 is the same at 6 6 of Fig. 3. Fig. 7 is a section of the lever and adjustable screw on the switchboard.

I provide a suitable switchboard 1, built upon a base-board 2, if desired. On this base-board I mount a small motor 3, that is supplied with electricity by the wire A, running from the battery 4. The motor of course is provided with the shaft 5, extending through a suitable framework 6, that is connected up with the switchboard by the bolts 7. Said shaft 5 carries on its end rigidly a pinion 8, that meshes with the spur-gear 9. On the shaft of said spur-gear is another pinion 10, that meshes with the spur-gear 11, whose shaft in turn is provided with a long pinion 12, that meshes with the spur-gear 13, which is carried on the switch-arm shaft 14. This gearing of course may be modified, as may be desired, to enable the motor to properly drive the shaft 14. The shaft extends through the switchboard and carries on its end the switch-arm.

The switch-arm is composed of the metallic strips 15 and 16, with the insulating-strip 17 between them, whereby they are insulated from each other. On the face of the switchboard, as seen in Fig. 2, I arrange in a circle around the shaft 14 a series of spring-contacts, so disposed that the end of the switch-arm as it is rotated will pass between them and separate them.

As seen in Fig. 4, the contact-pieces consist of a lower spring metallic strip 18, secured at one end to the switchboard and bent so that the other end will be held some distance from the board. The other or outer contact-piece 19 is held by the post 20, that is secured to the board. The two contact-pieces forming the pair are arranged so that their ends will engage each other, excepting when the switch-

arm is between them, as shown in Fig. 3. Each pair of the spring contact-pieces is connected up with the main-line wire, as seen in Fig. 3. There, it will be observed, the line Y′ leads from the switch and is connected up with the inner contact-piece 18 by means of the post 21. The main line X′ leads to the switch and is connected up with the contact-piece 19 by means of the binding-post 22. It is then seen that the wire leading from the switch when the switch-arm is between the contact-pieces is connected up with the inner metallic strip 15 of said switch-arm, while the wire X′, leading to the switch, is connected up with the outer metallic strip 16 of said arm.

The lever 23 is centrally pivoted at 24 to the post 25, which is secured to the switchboard. It is drawn normally toward the outer contact-piece 19 by the spring 26. Its inner end is provided with the adjusting-screw 50, which carries on its end insulation 51 to insulate it from the contact-piece 19. At its other end such lever, when the switch-arm is not between the contact-pieces 18 and 19, connects up the wires B^2 and B^3 through the binding-post 27, that is carried by the bracket 28, secured to the switchboard. The wire B′ leads from the motor to the switch, and the wires B^2 connect the binding-posts 27 in series, as shown in Fig. 2, the circuit being completed by the wire B^3, that leads back to the battery.

Extending to the rear from the switchboard is a pin or post 29, carrying a brush 30, that engages the collar 31, which is mounted on the shaft 14 and suitably insulated therefrom. There is also another post 32, carrying another brush 33, that engages with another collar 34, similarly mounted. The first-named collar 31 is connected up with the inner metallic strip 15 of the switch-arm by the wire Y^2, which lies in the recess or groove 35 in the shaft, as seen in Fig. 6. The other collar 34 is similarly connected up with the outer metallic strip 16 by means of the wire X^2. These two wires X^2 and Y^2 are secured to the switch-arm by suitable binding-posts.

The brush 30 is connected up with the magnet 36 by the wire X^3, and the brush 33 is connected up with the magnet 37 by the wire Y^3. These magnets are connected up with the duplicate pair, the magnet 36 being connected with the magnet 38 by the wire X^4 and the magnet 37 being connected with the magnet 39 by the wire Y^4. The magnets are carried on a suitable base-board 40.

41 is a small switchboard at the branch station carrying the switch-arms 42 and 43. The magnet 38 is connected up with the switch-arm 42 by the wire X^5, and said switch-arm is connected up with the relay 49 by the wire X^6. The magnet 39 is connected up with the switch-arm 43 by the wire Y^5, which in turn is connected up with the relay by the wire Y^6. The wire X^5 is grounded by connecting up the switch 43 with the wire Y^7, and the wire Y^5 is grounded by connecting up the switch 42 by the wire X^7. The wires X^7 and Y^7 are run to the ground in any suitable manner, as shown in Fig. 1.

Between each pair of magnets I place an armature, the armature 44 being placed between the magnets 36 and 37 and the armature 45 placed between the magnets 38 and 39. These magnets are of equal resistance. When one of the loop-lines is not grounded, the armature is maintained in the position shown. Each armature is provided with a contact-point 46, which is held out of engagement with the contact-point 47 on the opposing magnet by the springs 48. When, however, one of the branch wires is grounded, so as to destroy the equality of attraction between the opposing magnets, one of the armatures is drawn into contact with the contact-piece 47. The armature 44 is connected up with the motor by the wire C′, and the contact piece or point 47 is connected with the battery by the wire C^2. Likewise, the armature 45 is connected with the motor by the wire D′, and its contact-point 47 is connected with the battery by the wire D^2. It will thus be seen that there are three local circuits in this device, all through the motor. One consists of the wire B′, running to the switchboard and the wires B^2 around it, returning by the wire B^3 to the battery and thence by the wire A to the motor. The second circuit consists of the wire C′, leading from the motor to the armature of one set of the magnets, and the wire C^2, leading therefrom to the battery, which is connected up with the motor by the wire A. The third local circuit consists of the wire D′ to the second set of magnets and the wire D^2, leading therefrom back to the battery, which is connected up with the motor by the wire A.

It is also to be observed that the circuit through the main lines about the loop is as follows: This circuit is through the main wire X′, leading from a distant point, the binding-post 22, the outer contact-piece 19, the outer plate 16 of the switch-arm, the wire X^2, leading to the collar 31, said collar and the brush 30, the wire X^3, leading to the magnet 36, the wire X^4, leading to the magnet 38, the wire X^5, leading to the switchboard in the branch office, the switch-arm 42 on such switchboard, and the wire X^6, leading to the relay. From the relay the circuit passes through the wire Y^6, the switch-arm 43, the wire Y^5, the magnet 39, the wire Y^4, the magnet 37, the wire Y^3, the brush 33, the collar 34, the wire Y^2, the inner plate 15 of the switch-arm, the inner contact-piece 18, the binding-post 21, to the main wire Y′.

It is of course observed that when the switch-arm on the main switchboard is not between the contact-pieces 18 and 19 the loop or branch office is wholly cut out. The man at the branch office grounds one of the wires X^5 or Y^5. If X^5, he turns the switch 43 to the position shown by the dotted lines. This destroys the equality of the attraction between the opposing magnets in each pair, so that

the armature 44 is drawn into contact with the contact-piece 47; or if the wire Y^5 be grounded the armature 45 will be drawn into contact with the contact-point 47. This closes the circuit through the motor. I secure a strong machine by duplicating the magnets, but that does not affect the principle of operation. When this circuit is closed through the motor, it begins to operate, turning its shaft 5, and through its gearing and shaft 14 it rotates the switch-arm. In this manner the switch-arm is moved from between the pair of contact-pieces 18 and 19, where it was left by the preceding operation of the device, that is, as seen in Fig. 2, the switch-arm connects the branch office with the Philadelphia office.

Suppose the man at the branch office desires to talk with Washington. In such case he adopts the method which I have just described, which moves the switch-arm from between the contact-pieces to which the Philadelphia wires are connected up.

After the switch-arm leaves said contact-piece the circuit through the motor is further maintained, whereby it is kept in operation by the inner end of the lever 23 being permitted to move toward the switchboard, whereupon its outer end will be connected up with the contact-piece in the binding-post 27 and close the circuit between the wire B^2, leading to said lever 23, and the wire B^3, leading from said binding-post 27. In this way the circuit through the motor is established, passing through the wires B′ and B^2, as shown in Fig. 2, back through the wire B^3 to the battery and wire A to the motor. As has been stated, this circuit will continue the running of the motor until the switch-arm passes between the next pair of contact-pieces 18 and 19, and the loop-circuit is closed by turning the switch-arm 43 into the position shown in Fig. 1.

If, as has been presumed, the operator at the branch office desires to connect up with the main line on the switchboard he can throw the switch-arm 43 back into place as soon as he has permitted the motor to run long enough to carry the main switch-arm from between the contact-pieces on the switchboard, for after that the switchboard-circuit through the motor will cause the further operation of the motor, as has been described. If, however, he desires to move his switch-arm from the Philadelphia line to the Boston line, he should leave his branch office grounded until the switch-arm is approaching the contact-piece to which the Boston line is connected. After he has closed the loop-line the main switch-arm will stop at the next pair of contact-pieces, for as soon as it is moved by the motor in between them, as seen in Fig. 3, the motor-circuit is broken and the circuit from the main lines through the loop is established. The circuit through the motor is broken because when the main switch-arm separates the contact-pieces 18 and 19 it moves the lever 23 into the position shown in Fig. 3. The contact-pieces 18 and 19 are made long enough to allow for the further movement of the switch-arm by reason of the momentum of the motor after the circuit through it has been broken.

It is clear that the armatures 44 and 45 are not affected by the ordinary working of the line, owing to the fact that the resistance of the magnets opposing each other in each pair is equal, and the attraction of one balances the other, and the tension of the spring 48 keeps the contact-points 46 and 47 separate excepting when the loop-wire is grounded, as has been described. The operator at the branch station will know that the main switch-arm has passed from between the contact-pieces because of the absence of a circuit through his instrument.

Besides the objects and advantages which I have already enumerated there are others that will suggest themselves to persons skilled in the art. For instance, if the wire to which is connected the loop is open one way or the other by use of this switch the loop could be changed to another wire, thus enabling the person at the branch station to communicate in either direction.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a telegraph switch mechanism, the combination with the switch-arm and its shaft, of a motor so connected up with the shaft as to operate it, a battery, an armature, a contact-point, a circuit through the motor, armature, contact-point and battery, a branch line connected up with the magnet which operates the armature, and means on the branch line for operating said armature.

2. In a telegraph switch mechanism, the combination with a switch-arm and its shaft, of a motor so connected up with such shaft as to operate it, a battery, a pair of magnets, an armature between them, a contact-point, a circuit through the motor, armature, contact-point, and battery, a loop-line through the magnets connected up with the main line, and means for opening and closing such loop-line.

3. In a telegraph switch mechanism, the combination with a switch-arm and its shaft, of a motor so connected up with the shaft as to operate it, a battery, a pair of magnets, an armature between the same, a contact-point, a spring normally holding the armature away from such contact-point, a circuit through the armature, contact-point and battery, a loop-line connected up with the main line and running through the magnets to a branch office, and a ground-switch within such loop-line at the branch office.

4. In a telegraph switch mechanism, a series of circuit-breakers on the switchboard, a switch-arm that engages the circuit-breakers *seriatim*, a motor that operates the switch-arm, a circuit through the motor and the series of circuit-breakers when the switch-arm

is free from contact, and means for breaking such circuit when the switch-arm is in contact.

5. In a telegraph switch mechanism, a series of circuit-breakers on the switchboard provided with spring contact-pieces, a switch-arm that engages the contact-pieces *seriatim* and moves them somewhat, a motor that operates the switch-arm, and a circuit through the motor and series of circuit-breakers, such circuit so connected up with the circuit-breakers as to be broken when the switch-arm is in such engagement with a spring contact-piece as to force it in a position for opening the circuit.

6. In a telegraph switch mechanism, a series of pairs of spring contact-pieces on the switchboard, a switch-arm that engages the contact-pieces *seriatim* and passes between each pair, a motor that operates the switch-arm, a spring-controlled lever so pivoted that its inner end will always engage one contact-piece of a pair, a contact-point with which the other end of such lever engages when a contact-piece resumes its normal position after the passage from it of the switch-arm, and a circuit through the motor and the series of levers and contact-points, substantially as set forth.

7. In a telegraph switch mechanism, a switchboard having on its face a pair of contact-pieces, a shaft mounted in said switchboard, a motor to drive such shaft, a switch-arm mounted on the shaft comprising strips insulated from each other, collars mounted on the shaft, brushes mounted to engage the collars, wires connecting the collars with the metallic strips in the switch-arm, and wires extending from the brushes to the relay whereby a circuit from the main lines to the relay is effected through the switch-arm and rotary shaft.

8. A telegraph switch mechanism comprising a suitable framework having a switchboard, contact-pieces on the switchboard, main-line wires connected up with such contact-pieces, a shaft in the framework, a motor to drive the shaft, a switch-arm mounted on the shaft comprising metallic strips insulated from each other, a movable lever mounted on the switchboard one end of which engages one of the contact-pieces, a contact-point to be engaged by the lever, a battery, a circuit through the motor, battery, and lever and contact-point for each contact-piece, collars mounted on the shaft, brushes mounted to engage the collars, wires connecting the collars with the strips of the switch-arm, a pair of opposing magnets, wires connecting the brushes with the magnets, a branch office having a switch, wires leading from the magnets to such switch, an armature between such magnets, a contact-point, and a circuit through the motor, battery, armature, and contact-point, substantially as set forth.

In witness whereof I have hereunto set my hand this 14th day of March, 1896.

FRANK P. SCOTT.

Witnesses:
C. A. GORDON,
ALLYN G. ADAMS.